PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P172	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB 03/04826	International filing date *(day/month/year)* 07.11.2003	Priority date *(day/month/year)* 08.11.2002
International Patent Classification (IPC) or both national classification and IPC B06B3/00		
Applicant SONICO LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
08.06.2004	29.03.2005
Name and mailing address of the international preliminary examining authority: European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Lorne, B Telephone No. +31 70 340-1002

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB 03/04826

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1, 3-11	as originally filed
2	filed with telefax on 25.02.2005

Claims, Numbers

2-20	as originally filed
1	filed with telefax on 25.02.2005

Drawings, Sheets

1/1	as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

   These elements were available or furnished to this Authority in the following language: , which is:

   ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).

   ☐ the language of publication of the international application (under Rule 48.3(b)).

   ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

   ☐ contained in the international application in written form.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority in written form.

   ☐ furnished subsequently to this Authority in computer readable form.

   ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

   ☐ the description, pages:

   ☐ the claims, Nos.:

   ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

   ☐ the entire international application,

   ☒ claims Nos. 19,20

   because:

   ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (specify):

   ☒ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. 19,20 are so unclear that no meaningful opinion could be formed *(specify)*:

   see separate sheet

   ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.

   ☐ no international search report has been established for the said claims Nos.

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

   ☐ the written form has not been furnished or does not comply with the Standard.

   ☐ the computer readable form has not been furnished or does not comply with the Standard.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-18
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-18
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-18
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item III
Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The application does not meet the requirements of Article 6 PCT, because claims 19,20 are not clear.
The terms "with reference to the accompanying drawings" and "substantially as hereinbefore described" used in claims 19 and 20 are vague and unclear and leave the reader in doubt as to the meaning of the technical features to which they refer, thereby rendering the definition of the subject-matter of said claims unclear.

Re Item V
Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following document:
D1: US-A-5 110 403 (EHLERT THOMAS D) 5 May 1992 (1992-05-05)

2. The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses (the references in parentheses applying to this document) an apparatus for applying ultrasonic energy which comprises an applicator (see fig.1a), the apparatus further including an extender (fig 5, [503]) which extends from the outwardly facing surface and at least one booster at the end of the extender for boosting ultrasonic energy applied thereto to cause the applicator to oscillate, wherein the applicator and extender are integrally formed.

The subject-matter of claim 1 differs from this known document in that the extender and booster are integrally formed.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as a desire to design an ultrasonic apparatus which has an improved longevity and efficiency in a corrosive

liquid environment (sewage slurry).

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons.
In document D1, the waveguide and the horn are integrally formed in order to have equal amplitude ranges between the horns being tested but the horn is connected to the booster with threaded stud joints. It would not be obvious to modify such a configuration based on the teaching of D1 since D1 discloses a sonoprobe ultrasonic apparatus used for welding or cutting applications and requires that the boosters and horn are detachable so that different testing configurations can be used. The prior art device is used in a different environment and does not mention the problem of separation of components at their points of attachment to one another when subjected for protracted periods to the destructive impact of ultrasonic oscillations and to attack from all directions by the liquid.
None of the other prior art documents cited in the search report describe an integrally formed ultrasonic apparatus.

For the same reasons, the corresponding method claim 10 is considered new (Article 33(2) PCT) and as involving an inventive step (Article 33(3) PCT).

Claims 2-9 and 11-18 are dependent on claims 1 and 10 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

both the central aperture and over the outer surface.

It is known for a plurality of such applicators to be stacked with their central apertures aligned, and for the slurry to be pumped or otherwise caused to flow through and around them in series. It is also known for individual applicators to be driven by more than one electro-acoustic generator, in order to increase the energy that can be applied to the applicator and hence imparted to the slurry. Nevertheless, the application of ultrasonic energy in sufficient quantities to drive such applicators at the intensity levels required, for example for the treatment of sewage, can place considerable demands upon the construction techniques used to fabricate the horns. The energy demands of such applications can also lead to horn damage or failure, which may require shut-down of the processing plant, and time consuming repair and/or replacement of equipment.

The present invention seeks to provide apparatus for applying ultrasonic energy and a method for manufacturing the same which can overcome the aforementioned difficulties.

According to the present invention there is provided apparatus for applying ultrasonic energy which comprises an applicator having an outwardly facing surface, the apparatus further including an extender which extends radially from the outwardly facing surface, and one or more boosters at the end of the extender remote from the applicator for boosting ultrasonic energy applied thereto to cause the applicator to oscillate, wherein the applicator, extender and booster are integrally formed.

Herein the term "integrally formed" means that the applicator,

CLAIMS

1. Apparatus for applying ultrasonic energy which comprises an applicator having an outwardly facing surface, the apparatus further including an extender which extends from the outwardly facing surface, and at least one booster at the end of the extender remote from the applicator for boosting ultrasonic energy applied thereto to cause the applicator to oscillate, wherein the applicator, extender and booster are integrally formed.

2. Apparatus according to claim 1 wherein the applicator has a central aperture defined by an inwardly facing surface.

3. Apparatus according to claim 2 wherein the inwardly facing surface oscillates when ultrasonic energy is applied to the apparatus.

4. Apparatus according to any one of claims 1, 2 or 3 wherein the integral applicator, extender and booster are formed from a rolled forged, or cast, material.

5. Apparatus according to any preceding claim wherein the integral applicator, extender and booster are formed from metal.

6. Apparatus according to claim 5 wherein the metal is an alloy.

7. Apparatus according to claim 6 wherein the alloy is a titanium-containing alloy.

8. Apparatus according to claim 5 wherein the alloy is a